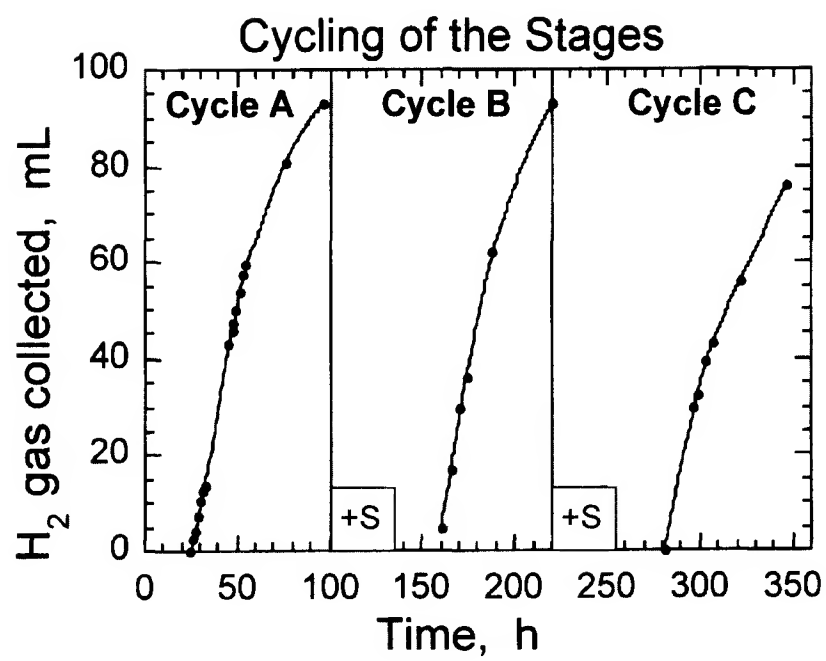


FIG. 1



REPLACEMENT SHEET

FIG. 2

Chlamydomonas reinhardtii chloroplast Sulfate Permease (*SulP*) gene structure

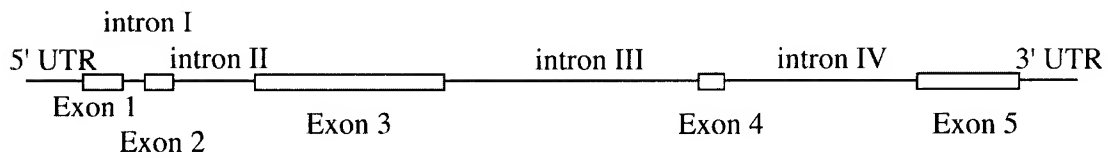


FIG. 3

reinhardtii chloroplast Sulfate Permease (*SulP*) amino acid sequence

MERVCSHQLASSRGRPCIAGVQRSPIRLGTSSVAHVQVSPAGLGRYQRQRLQVVASAAAA
AAFDPPGGVSAGFSQPQQQLPQQHPRQPQAVAEVAVAESVSAPASAAPSNDGSPTASMDG
GPSSGLSAVPAAATATDLFSAAARLRLPNLSPIITWTFMLS YMAFMLIMPITALLQKASL
VPLNVFIARATEPVAMHAYYVTFSCSLIAAAINC VFGLAWVLVRYNFAGKKILDAAVD
LPFALPTS VAGLTLATVYGDEFFIGQFLQAQGVQVV FTRLGVVIAMIFVSEFPFVVRTMQP
VMQEIQKEMEEAAWSLGASQWRFTFDVVL PLLPALLTGTALAFSRALGEFGSIVIVSSN
FAFKDLIAPVLIFQCLEQYDYVGATVIGTVLLLI SLVMMLAVNQLQKLARK* (SEQ ID NO:1)

REPLACEMENT SHEET

FIG. 4A

Coding sequence of CrpSulP

5' UTR: 173 bp, Exon1: 124 bp, intronI: 77 bp, Exon2: 78 bp,
intronII: 279 bp Exon3: 620 bp, intronIII: 834 bp,
Exon4: 87 bp, intronIV: 699 bp, Exon5: 327 bp, 3'UTR: 575 bp

Total length: 3873 bp

```

gcttagtacc taagcaaaaa taccaaagcc ttatcctgag ttgtcaacaa gaactccagc 60
ctgcgacgat gcaaagcctt tcttgagcgg gttgatggac tttgctttgt tatctgtcca 120
gtaagccacc agacactacc aagtagagta atccatttgt ataggtacag aatatggagc 180
gagtttgcag ccatacagctt gcctcgtcgc gagggaggcc atgcatcgct ggggtgcagc 240
ggtcgccccat ccgactaggg acttcaagcg ttgctcatgt gcaggctctct ccggcaggta 300
agcaccgcgc tcggcggcgt gtacacatgg ggccgtcagg ccaactgcgt ttgttggtta 360
tgcaaccgaa acaggccttg ggagatatca acggcaaaga ctgcaagtcg tggcgtctgc 420
agctgcggca gcggccttcg accctcctgg aggtgcgtgg cgtgagggtc gcacgggtgc 480
gggttgccct ggaaaccaag cctcgccacg actacctgca acagcattgc ccgcatctcc 540
agccccctac cctcgagtgc ctcccgaga cctctatccc ctgcgcatca ttggttcggg 600
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gctccccgca ggtgtctccg ccgggttctc gcagccgcaa cagcagctgc cacaacagca 780
cccacgcaa ccacaggcg tggcgagggt agctgtcgcc gagtcagtct cggcgccgc 840
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cggcctcagc gccgtgcccg ccgcccgcac cgccaccgac ctcttctccg ccgcggcgcg 960
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ggtgcgctac aatttcgcgg ggaagaagat cctggacggc gcgggtggacc tgccgttcgc 1260
gctgccgacc tcggtggcgg gcctcacgct tgccacgggt tacggcgacg agttcttcat 1320
cggccagttc ctgcaggcgc agggcggtgca ggtgcgtgcg tatagcatag tggagtgtgg 1380
ttagcagctg ggggtccggc agtagttccc gccctagtga ggtcgaaact ataccagaag 1440
aagaggacga acatggggct atccagcaag ctctcttagg gaaggaggag ttggggagaa 1500
cgggtggggtg ggaggagag ggagggcggt ggctgggagg gaagggttaag gcgggaggga 1560
gatggttagca cggggcggtg gggacgcaga aggatgacag gcggctgcag ggaagggatg 1620
gggaagcgga gctggggaca gtgcgaagag ccgggagaga ggggaagttt gagtcaaggaa 1680
gaggggctag agaggggcat gcggactcct gctgggattt aggtgcgtgc tcattgagga 1740
gcccttgaa tcagcggacg gaaacgtggc cgacggggtc tgccgagcac accaggctag 1800
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ccgcagttg gaggatgctc cacgcgcttc agcttgccat gtctggggtc tgggtctgga 2040
cgcaatcagc gtgtgagggg ccaactctat atggaattat ggatacctc caactaccag 2100
cacgtaggct gccggaacgc ggctgaagcg gctggcctgc cccctcatcc tctcgttccc 2160

```

REPLACEMENT SHEET

FIG. 4B

ctgtttttgt	cccctgtcca	cccaggtggt	gttcacgcgg	ctgggtgtgg	tgatogccat	2220
gatcttcgtg	tccttcccct	tcgtggtgcg	caccatgcag	cccgtcatgc	aggtgagagc	2280
gcccaggagg	cggagccatg	gcgggttggg	gcgggttggg	gcgggttggg	gcggggcgcg	2340
gatggggcgg	cttggggagt	aatgtggggc	ggatgggggtg	gcagcctggc	agggatatggg	2400
agcgagagga	tagcggggac	aggggacagg	gaagggaagg	gaaggggaaag	gatgccctat	2460
gcgagcaaag	gggttatggg	aaccggcggg	tggggctggg	agcgacggga	gcagggagggg	2520
agtgcacgga	acgggggcaa	ggcggacagg	gtgaggagg	gtgcaggccg	gactgggatg	2580
ggtcatgtgt	cctggtcggg	ggtgtagccg	tgggaggcgg	gcaggcagcg	tgtgttcttg	2640
cacgggtgtt	tggcgaaaga	taccacggca	tggtatgggg	ccagttagggc	agggaagaac	2700
cgttggaacac	gacttcgttg	acagatctag	ttcattgcac	cgggtcgcga	ccaagggttg	2760
cggcgagccc	ggcccggcac	gtcogagtac	cccggagccg	taacgccgca	acccgccttg	2820
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gcccgcgctg	ctgaccggca	cggcactggc	cttctcgcgc	gcgcttggcg	agttcggatc	3120
cattgtcatc	gtgtcctcca	actttgcctt	caaggacctg	atcgcgcccg	tgtgatctt	3180
ccagtgcctg	gagcagtacg	actacgtggg	cgccaccgtg	atcggcacag	tactgctgtt	3240
gatttcgctg	gtgatgatgt	tggcggtgaa	ccagctgcag	aagctggcgc	gcaagtggagg	3300
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gaggagggtt	cagggtgagg	caggagtggc	aggtggtgga	gggtgcaggg	cgggggtgttg	3420
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acgtattagg	atatgggagg	tggtatgcag	ttgaaggggg	gggtggcaat	ctggacgggg	3540
actcactgtt	tactaggcac	gcatgtcgca	ggagtggata	tcgatgggtg	tggggatgtc	3600
agcacgcctt	gcttgagttg	ggccatggga	ccggggacta	ggcttggttg	cgagccgagc	3660
cagtcaccag	ggagacgtac	gagcgcacac	agtgattacg	gggattgatt	aggcggcgaa	3720
ttgacgcaa	tccacggggg	ctgtggcttg	ggggaggcag	ggattgagcg	aaggacgcac	3780
tgcaagctca	ggcagtcgca	tgcccgtaac	ctgcttcttg	tccagtgtgg	agacaagact	3840
ggcaatcgtg	gtcctttgca	attcatggcg	cgc (SEQ ID NO:2)			

REPLACEMENT SHEET

FIG. 5

Full length cDNA sequence of *CrcpSulP*: 1984 bp

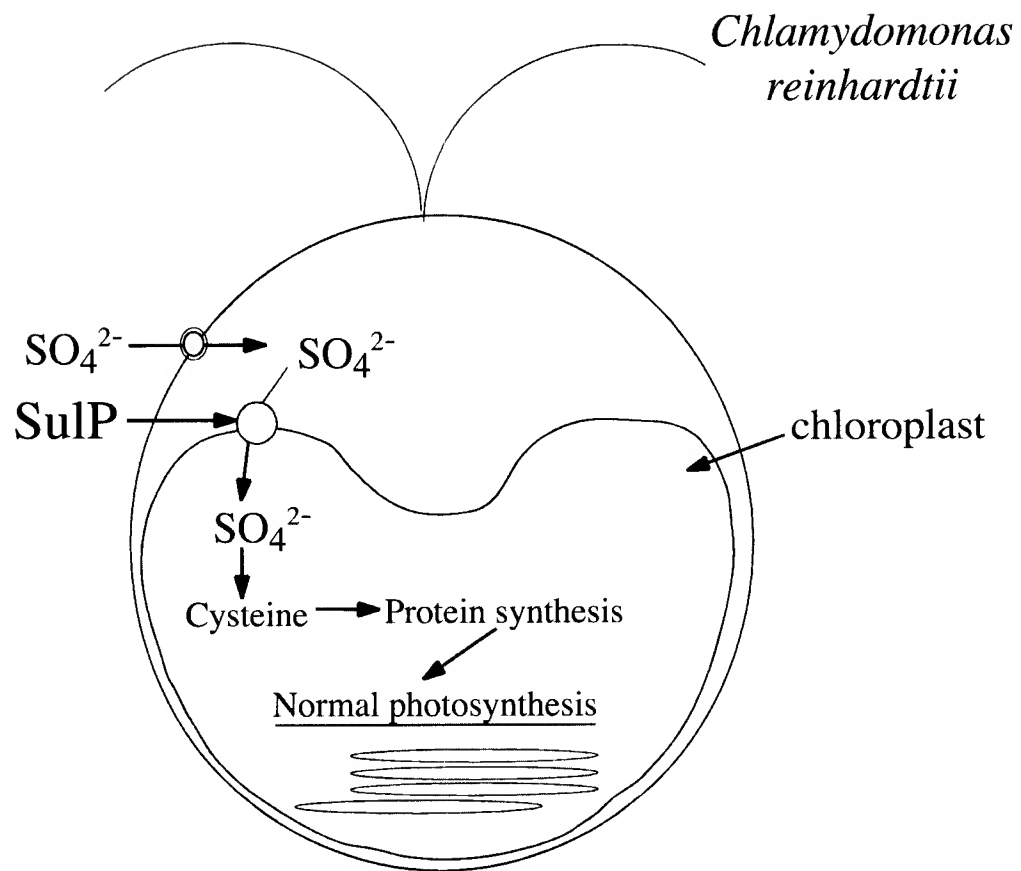
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gtaagccacc agacactacc aagtagagta atccatttgt ataggtagac aatatggagc 180
gagtttgtag ccatcagctt gcctcgtcgc gagggaggcc atgcatcgct ggggtgcagc 240
ggtcgcccat ccgactaggg acttcaagcg ttgctcatgt gcaggtctct ccggcaggcc 300
ttgggagata tcaacggcaa agactgcaag tcgtggcgtc tgcagctgcg gcagcggcct 360
tcgaccctcc tggaggtgtc tcgcgcgggt tctgcgagcc gcaacagcag ctgccacaac 420
agcaccacag ccaaccacag gcggtggcgg aggtagctgt cgccgagtca gtctcggcgc 480
ccgcttctgc ggcgccctcc aatgatggct cgcccacggc ctccatggac ggcgccccca 540
gctccggcct cagcgccgtg ccgcgcgcgc ccaccgccac cgacctcttc tccgcgcgcg 600
cgcgccctcc cctgcccac ctctcccca tcatcacctg gaccttcatg ctctcctaca 660
tggccttcat gctcatcatg cccatcaccc cgctgctgca aaaagcctcg ctctgtccgc 720
tcaacgtctt catcgcgcg gccaccgagc cgggtggcgat gcacgcctac tacgtcacct 780
tctcctgctc gctgatcgcg gccgccatca actgctgtgt ttgcttcgtg ctggcctggg 840
tgctggtgcg ctacaatttc gcggggaaga agatcctgga cgcggcgggtg gacctgccgt 900
tcgcgctgcc gacctcgggt gcgggcctca cgcttgccac ggtgtacggc gacgagttct 960
tcatcgcca gttcctgcag gcgcagggcg tgcaggtggt gttcacgcgg ctgggtgtgg 1020
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aggaaatcca aaaggagatg gaggagggcg catggtcgct gggcgccctcg cagtggcgca 1140
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ccttctcgcg cgcgcttggc gagttcggat ccattgtcat cgtgtcctcc aactttgcct 1260
tcaaggacct gatcgcgccc gtgctgatct tccagtgcct ggagcagtag gactacgtgg 1320
gcgccaccgt gatcggcaca gtactgctgt tgatttcgtt ggtgatgatg ttggcggtga 1380
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caggtggtgg aggggtgcag gcggggtggt gggatgggat gggatgggac cgtgggaggg 1560
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cagtgattac ggggattgat taggcggcga attgacgcaa atccacgggg gctgtggcct 1860
gggggaggca gggattgagc gaaggacgca ctgcaagctc aggcagtcgc atgccgtac 1920
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gcgc
1984

```

(SEQ ID NO: 3)

FIG. 6



REPLACEMENT SHEET

FIG. 7A

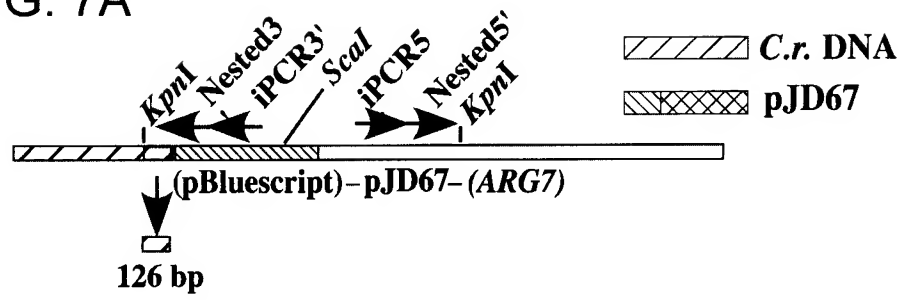
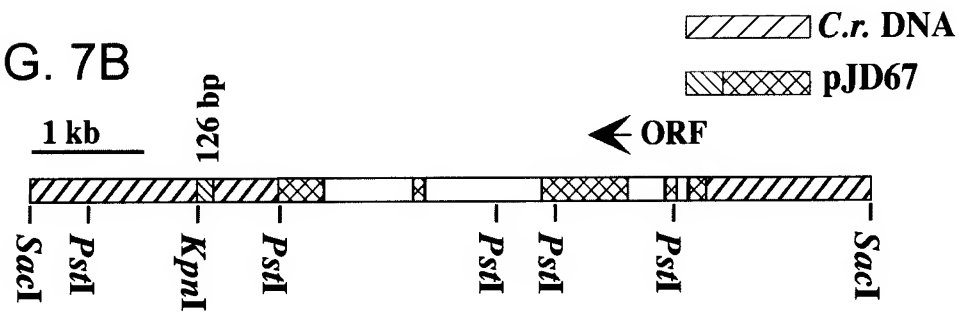


FIG. 7B



[illegible]

FIG. 8A
CONT.

Nephroselmis
Mesostigma
Chlamydomonas
Chlorella
Syn. PCC7942
Marchantia
Bacillus

Nephroselmis
Mesostigma
Chlamydomonas
Chlorella
Syn. PCC7942
Marchantia
Bacillus

Nephroselmis
Mesostigma
Chlamydomonas
Chlorella
Syn. PCC7942
Marchantia
Bacillus

FIG. 8B

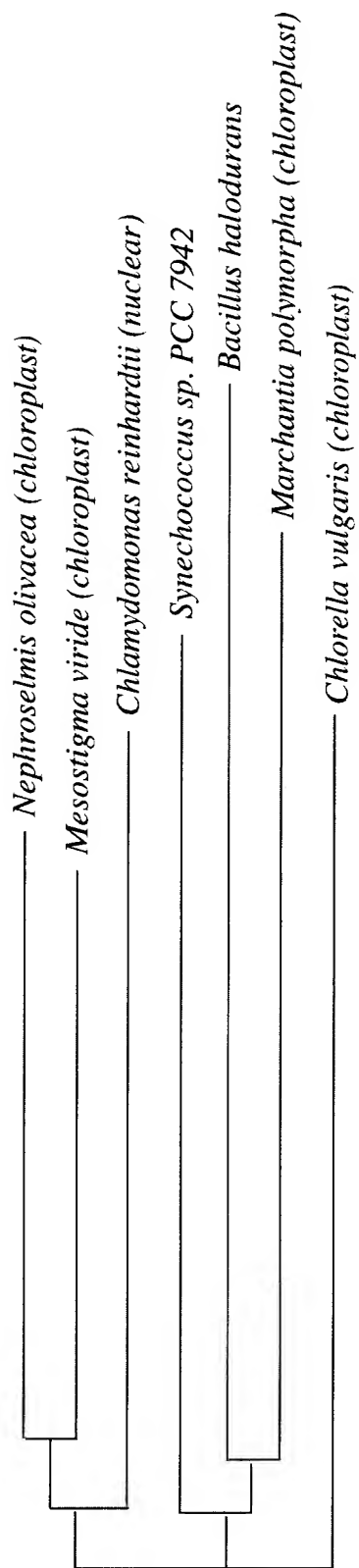
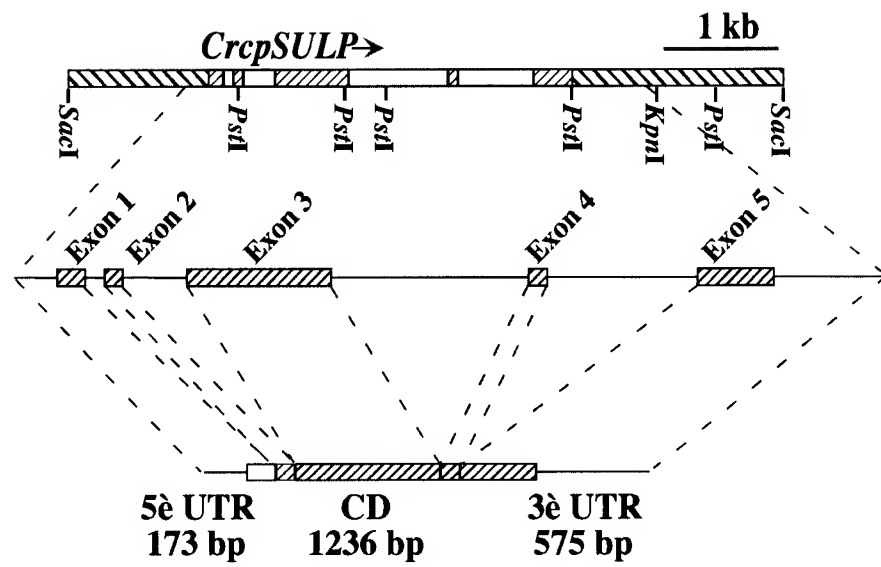
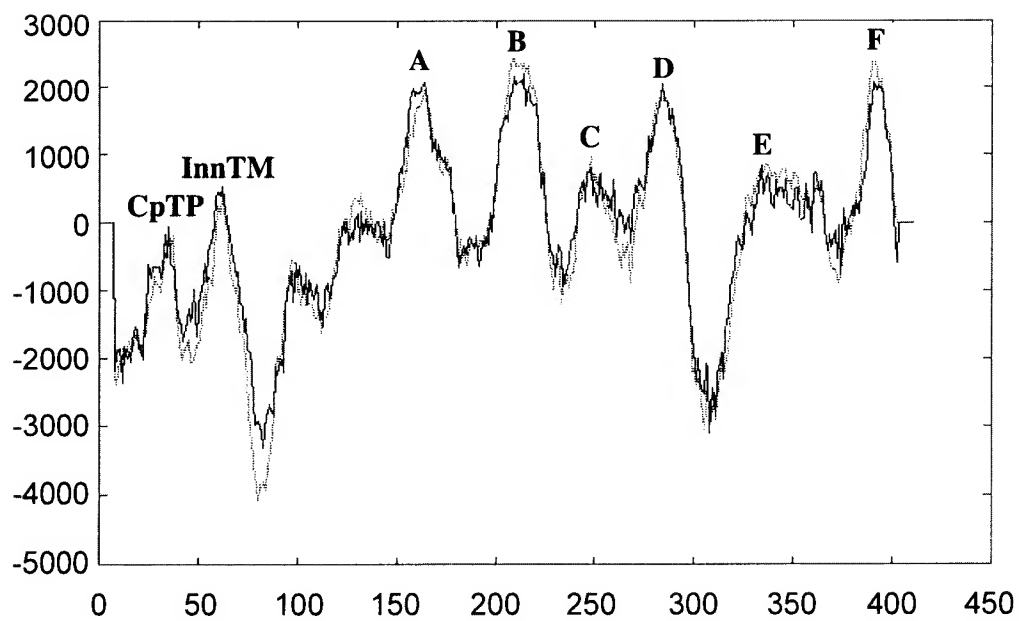


FIG. 9



REPLACEMENT SHEET

FIG. 10



REPLACEMENT SHEET

FIG. 11A

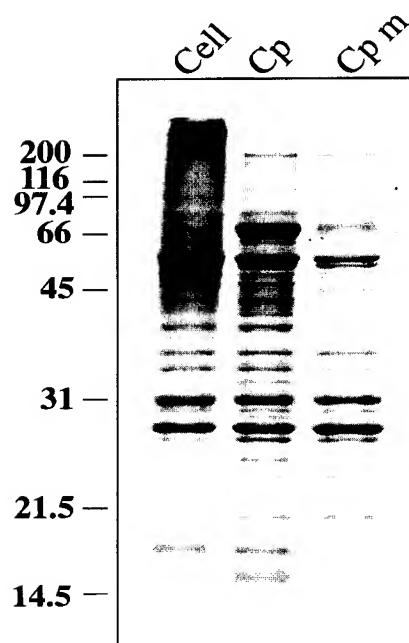
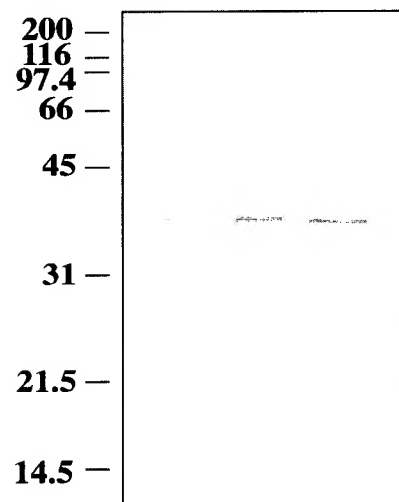


FIG. 11B



REPLACEMENT SHEET

FIG. 12A

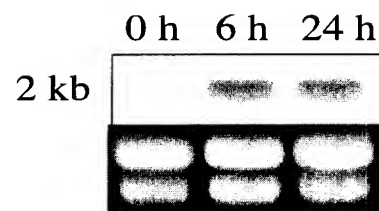
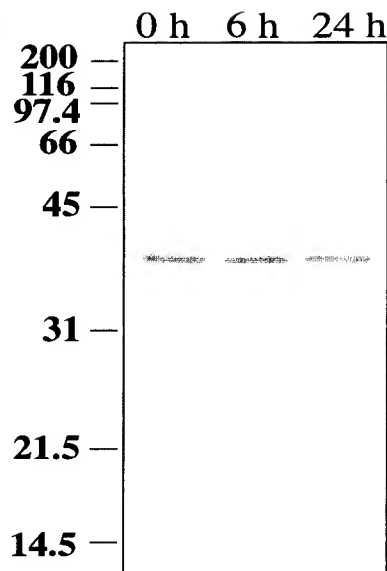
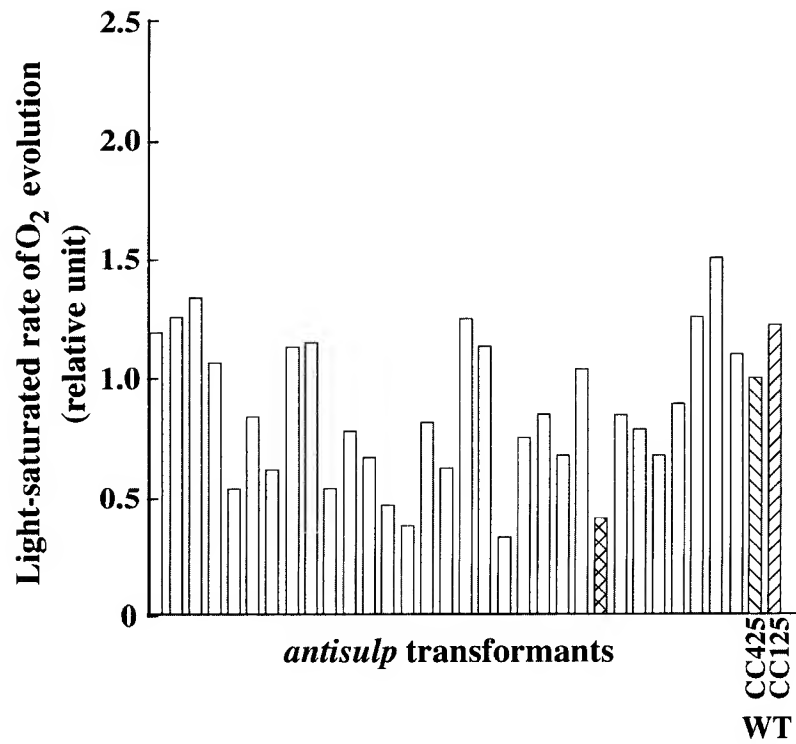


FIG. 12B



REPLACEMENT SHEET

FIG. 13



REPLACEMENT SHEET

FIG. 14A

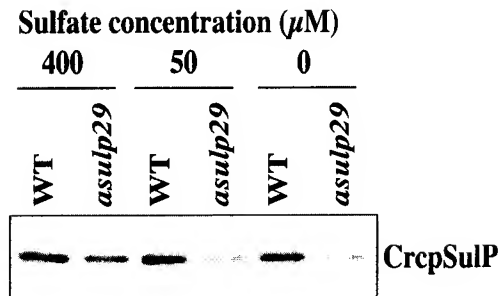


FIG. 14B

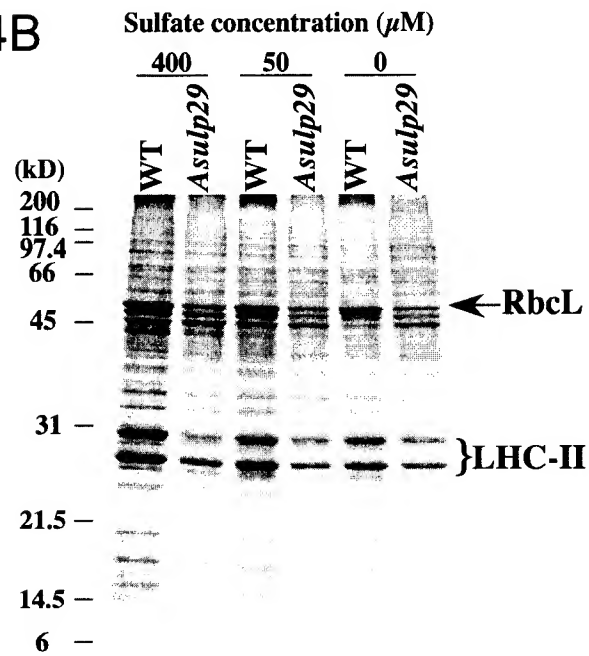
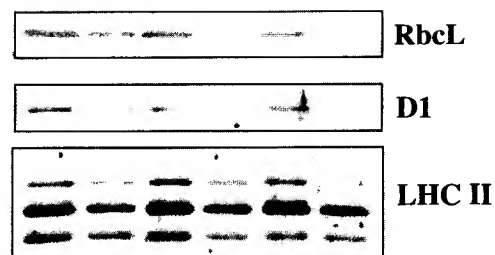


FIG. 14C



REPLACEMENT SHEET

FIG. 15A

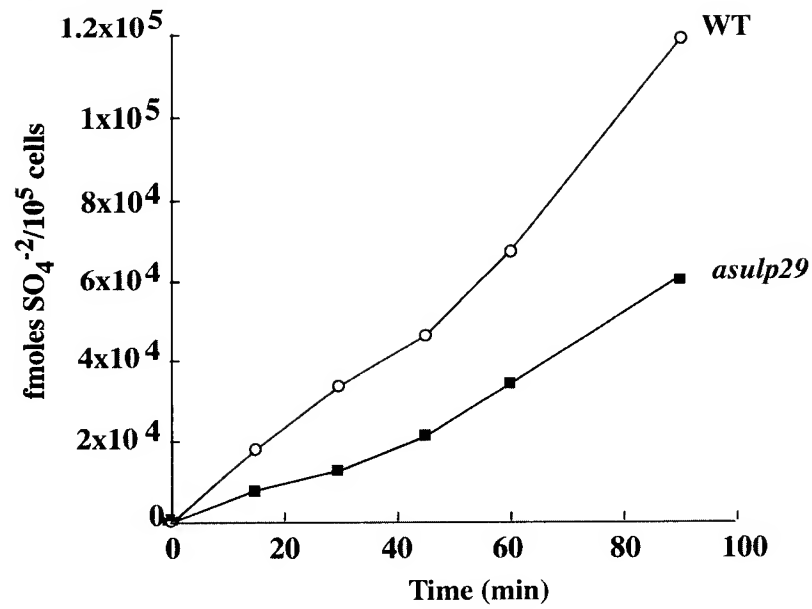
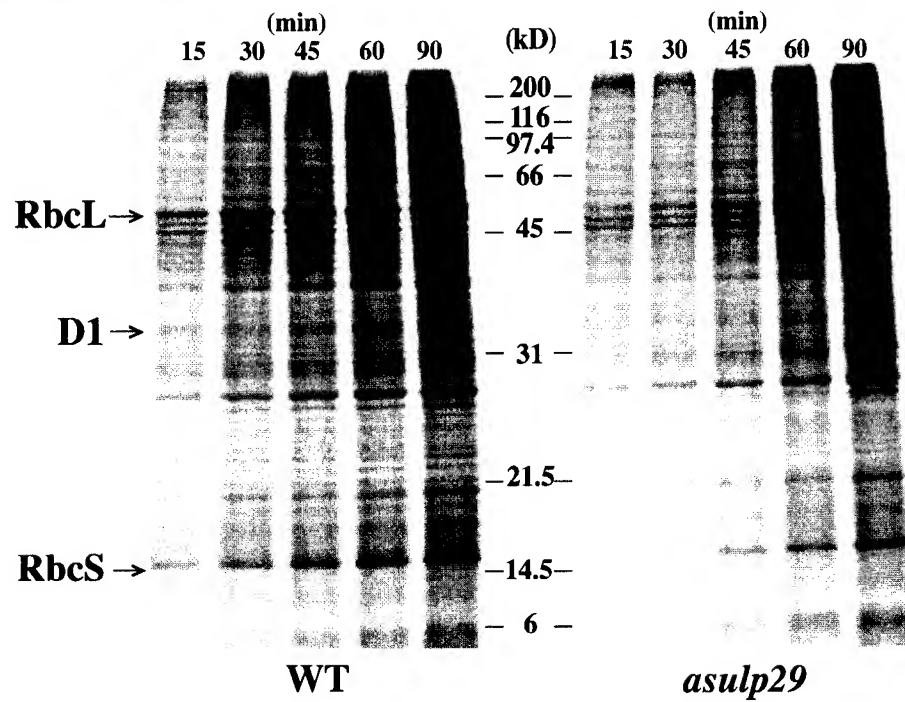
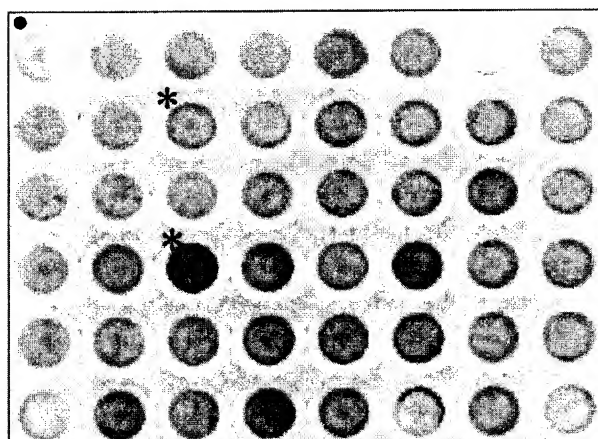


FIG. 15B



REPLACEMENT SHEET

400 μM S
(TAP, S₄₀₀)



150 μM S
(TAP, S₁₅₀)

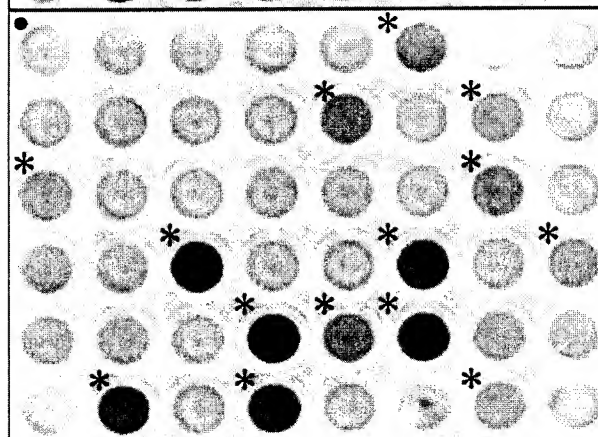
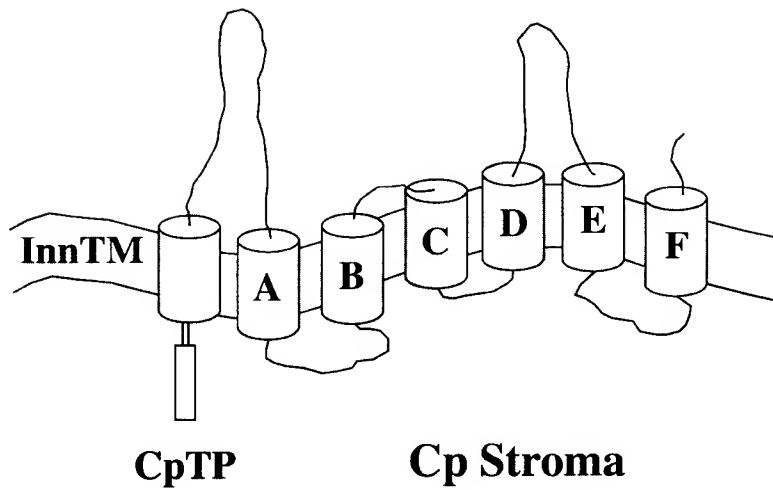


FIG. 16

FIG. 17



REPLACEMENT SHEET

FIG. 18A

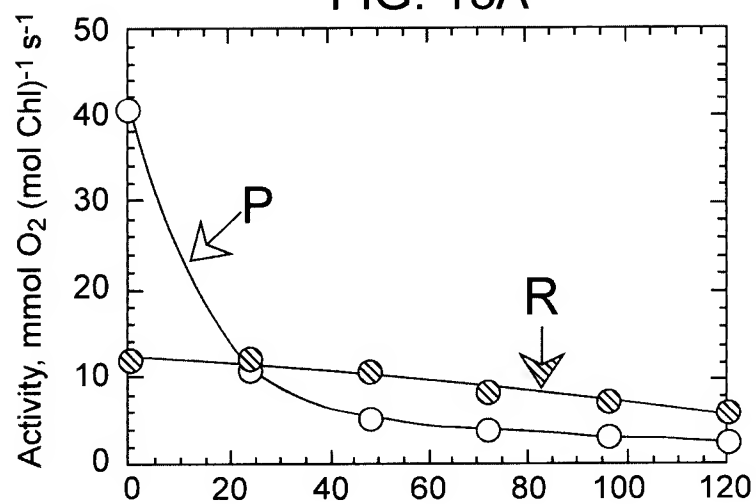


FIG. 18B

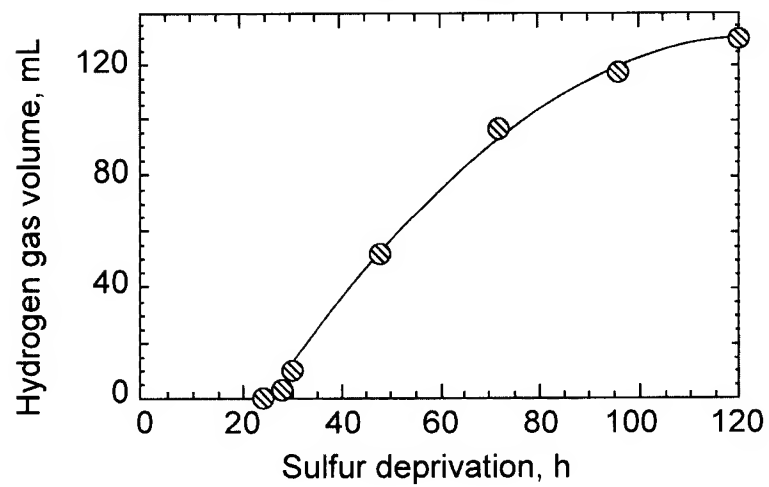


FIG. 19

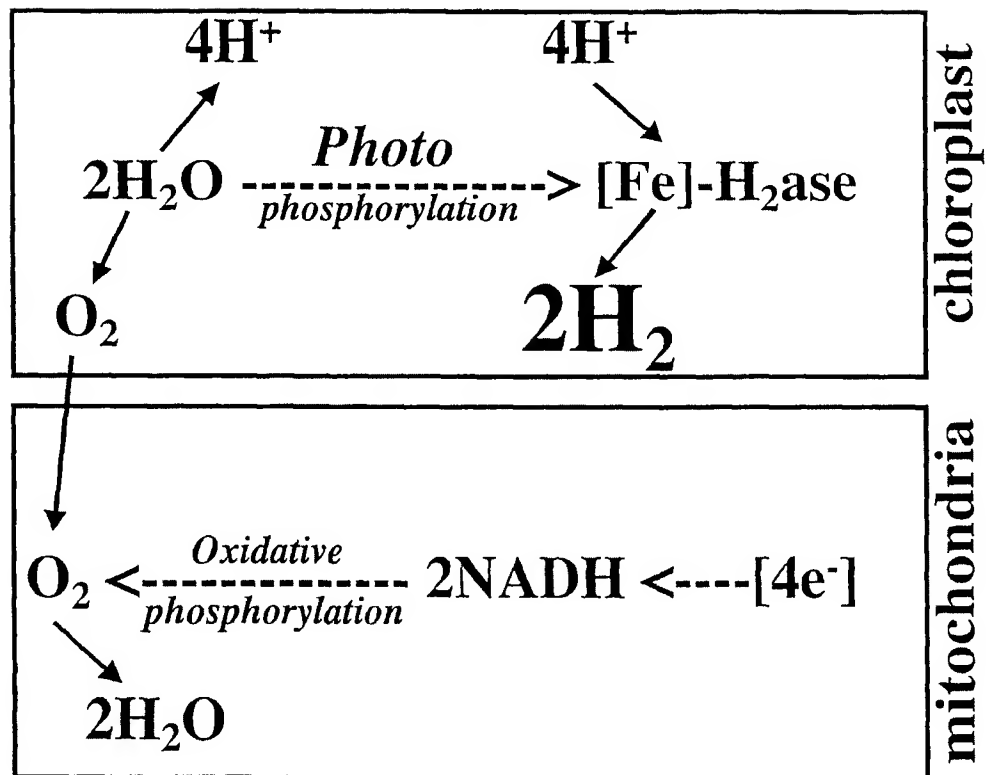
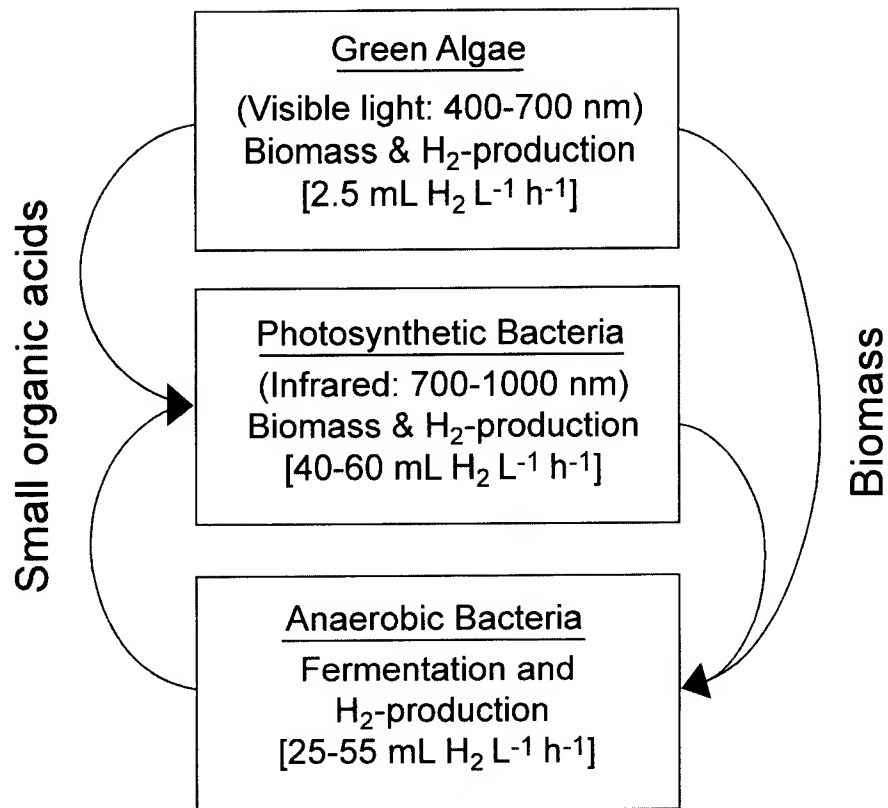


FIG. 20



REPLACEMENT SHEET

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(SEQ ID NO: 04)

FIG. 21

REPLACEMENT SHEET

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GAAGCACTTCAGCACCGCCAAAGGCTGTTCAGGGCGGTGGACGGCGTGGACGTGGACATCGAGCCCAGCTCCA
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CATTATGAAGTTCGTGGGCGAGACCAACGTGGTGCCGGCCACGTGCTGCTGGCCAAGCGCATGCGCTTCAACA
CCTCCAAGACCAGCGTCATGTTCCGGCCGACGACATTAAGCTGTTCAAGACGGTGCCGCCGGAGAGCGGCGAG
GGCGCGCTGACCACGGTGGGCGCCAACGTGGCGGACAAAGCCAACCTGGGCTGGGTGGTCAAGTACACGCTGCG
CTTCGATGACGACGTGGAGTGCAGCTGCAGCTCAGCCGCGACCAGGACGAGCGCGAGTACAACCTGGTGGTGG
GCAGCCGCGTGTTCGTGCACGTGCCGCACCGCACCATGATGGGCTTCAACGCCAGCGACGTGGACAGCACGCCC
ATCGTGTAATGTGCGGGGTGGCGGCTGTGGCCAGCGATTGTTGCAATGCAGTCCAGCGTGTCTTGGTTTGGT
TCCAGTGACACCCATCCAGGGCACAGGTCCCTGAGCAGCGGGTGTGGTGATGGGTGGAGCAGTTGTACCCGA
TTCTCGCATGCAAGGGGGCGGGGCGCCACGGGGTGGGAGAGCGGAATGGCGGTGAGGTGGGCTACTGCATGCG
GCCGTGGAGGAACGGAGGGGTGCACAGGCGGGCAGGTAGACAGGCGGAGCGGGCTGGGTGAGCGGGGCTGTAGT
TTGGGGGTGGAGGCCGTGCAGACTGGTTGGGATACTGACAGATCAATGAGCGGCGTCTGCTCCATGGGTGAGTA
GGAGAGCGGTGTGGGTGTGTGCAGTTGCGAGTTCTGGAGCGTTGTGCGCCTCGCGCTGTGTGCGCGCGCCCGTG
CGTCTGCGGGCGCTGTCGGAGACGGGCGATGTACATGAAGCTGGACCTGGGCCTGTCTCACAAATATCCCTTAT
GTTAATAGTAGGATGTCGCAATCGTGCCCTGGAGCCACCTGATGTGTGTGTACAGGTGGCAGTAGTTTGGCC
TTGCGGGAGGTAGCACGTCTTTCATGAGAGTGCCTGTGCGTGACCGCTTTTACATTGCCAATCACGCTGGAAGG
TGAAACCATGCATCATGCGTGCTATCAGGAGATGCAGACGGCGGATTGCTGCCAAAATGTTCTGTTGTTGGTGT
GCAGACTTGGTGGCGAAGGGGCCAGGCGCCAGGGGTATGCTGCGTGCCAAGGAGCTGCTGCCGCCACGAGTGA
CCAGCGAAACTTGTAAATTGAATATTGTATCCT (SEQ ID NO: 05)

FIG. 22

REPLACEMENT SHEET

GGGCAGCGTATAAGTAATGTCGTTCTTGGCTCCCAGCTTAGGCGTCGCGCGGGGGATTCTGGAGCCGGCGAGTGC
AGCGAGGCCGCTGCGCACGCGGCCGGTCACGCACCCGTTCTAACAAGCGATAGGACTGGTGGACCTGCCGCTAA
TCATGACAGGCCTGCCGGTGCTCCCAGCCCCATGCGGCGTCGTTGACGCCCTCCAGCAGCGGGCAAGCAAGCCA
GCAAGGCGACCCCCAGCGCTCGCAGCACCAGCAAGCGCAGCGCCAGGACCAGCAGCAGTCGCAGTCGCGGTGCT
CCAATCACACCTCATCACCGCGGCCACGCTGCTGCCAGCCCTGCCGCTCCGCTCCCGGCGGCAACGGCGACGG
CGATGGCGGCGAAGCTGCGGGGCCGAGCCGCTCGCGGACGTGCGGGCTCAGCCGCCGAGGTTGTGCTGACGCT
GGCGTCGTTTCGCGGTGACCAAGCTGGCGTACGTGCGTGTGACGCGCGCTTCCGGGAGTGGTACGAGCGCACGAA
GGGCGTGGATGTGCGCTTCCGCTCACCTTCGCCGCCAGTGGCGTGCAGGCCCGCGCCGTGATCGATGGCCTGCC
CGCCGACATCGTGGCCCTGGCGCTGCCTCTGGACCTGGACAAGATCGTGTGCGCGGGGCTGATCCGGCCCCACTG
GCGCAGCGCCTACCCGGCAGCCAGCGTGGTGTGCGAGACCACCGTGGCGTTCGTGGTGCGCCAGGGCAACCCCAA
GAACATCCGCACCTGGGAGGACCTCACGCGGGCGGGTGTGGAGGTGGTGTGGCCAAACCCCAAGACCCGGGAGT
GGCCAGGTGGATCTTCTGGCCCTGTGGGGCGCCAAGATGAAGAAGGGCAACGCCGCCGCGCTGGCGTATGTGCA
GCGCGTGTTCGAGAACGTGGTGGTGCAGCCGCGTGATGCGCGCGAGGCGTCGGACGTGTTCTATAAGCAGAAGGT
GGGCGACGTGCTGTTGACGTACGAGAACGAGGTGATCCTGACCAACGAGGTGTACGGCGACAAGGCGCTGCCGTA
CCTGGTGGCCTCCTACAACATCCGCATCGAGTGCCCGCTGGCGCTGGTGGACAAGGTGGTGGATGCCCGCGGCCC
CGAGGTGCGCGAGGCGGCGTCCGAGTTCTGCCGTTTCTGTTACGCCCCGCGCGCAGCACGAGTTCGCGCGGCT
GGGCTTCCGCGTGAACCCGCGCACCTGCAAGGAGGTGGCGGCGCAGCAGACCGGACTGCCGCCCGCAAACCTGTG
GCAGGTGGACAAGGAGCTGGGCGGCTGGGCTGCGGCCCAGAAGAAGTTTTTCGACGCTGGCGCCATCCTTGACGA
CATCCAGTCCGCCGTGGGCAAGCTGCGTGTGGAGCAGCGCAAGGCGGCGCAGGCGGCGGCCAGGCGGTAGAGAGA
CGCGGTACAAGTGCTCGGGTGCTCAGCAGGAGCTGCAGCAGGGGCAGCAAGAGGGCCTTGACAGGAGGGGAATGGT
AGGCAAAGGCGGCAGGGGAGGCGGGATGGCGGGATGAAGTGAGGGTGTGCAAGCAGCGATGTGTGCCAAGGACGG
TGTCGGCGATGTACATGATAACATGAGGAGACAGGAGCATCTCCTGGCAGGAGGCGGCAACCGTGGAGTGTCTGA
AAGGAGAACTTGATTGCTCAGTGTGGGACAGATAACGGAGGGGCGGGGTGTGGGGCGTGGGGCTTATCGGTGTGCT
TCTATGGGGAGGCCTGACTGCATTGGGGGCGACGTAGTGTGATGGCCGCTACACGCTTGCTCGGAACGACATAA
ACAGGCGTTTCAGGCCATGGCTGCATGAGGCTTGATGTGCTATCGCGGACTGTC (SEQ ID NO: 06)

FIG. 23

REPLACEMENT SHEET

MASTTLLQPALGLPSRVGPRSPLSLPKIPRVCTHTSAPSTSKYCDSSSVIESTLGRQTSV
AGRPWLAPRPAPQQSRGDLLVSKSGAAGGMGAHGGGLGEPVDNWIKKLLVGVAAYIGLV
VLVPFLNVFVQAFAGIIPFLEHCADPDFLHALKMTLMMLAFVTVPLNTVFGTVAAINLTR
NEFPQKVFLLMSLLDLFSPVVTGLMLTLLYGRTGWFAALLRETGINVVFAFTGMALAT
MFVTLPFVVRELIPILENMDLSQEEAARTLGANDWQVFWNVTLNIRWGLLYGVILCNAR
AMGEFGAVSVISGNIIGRTQTLTLFVESAYKEYNTEAAFAAVLLSALALGTLWIKDKVE
EAAAAESRK* (SEQ ID NO: 07)

FIG. 24

REPLACEMENT SHEET

MASLLAQTT SRLGARPA AQAGPVAQMAPMASRVQPAMPSALLPLHARATTTSVAC
RAASIDKPVVYTPRDSSQQSSNGAGEVSMSISSMDEVGPSYEGII TDAPTRPTGL
YVRVRNMVKHFSTAKGLFRAVDGVDVDIEPSSIVALLGPSGSGKTTLLRLIAGLE
QPTGGNIYFDDTDATNLSVQDRQIGFVFQSYALFNHKTVAENIKFGLEVRKLNID
HDKRVAELLALVQLTGLGDRYPRQLSGGQRQRVALARALASNPRLLLLDPEFGAL
DAVVRKQLRTGLREIVRSVGVTTIIIVTHDQEEAFDLADKVVFVFNRLVEQQGSPT
EIIKRPRTPFIMKFVGETNVVPATSLLAKRMRFNTSKTSVMFRPHDIKLFKTVPP
ESGEGALTTVGANVADKANLGWVVKYTLRFDDDDVECELQLSRDQDEREYNLVXGS
RVFVHVPHRTMMGFNASDVDSTPIV* (SEQ ID NO: 08)

FIG. 25

REPLACEMENT SHEET

MSFLAPSLGVARGILEPASAARPPAHAAGHAPVLTSDRTGGPAANHDRPAGAPSPH
AASLTPSSSGQASQQGDPQRSQHQAQRQDQQSQSRSLSHLITAATLLPALPPP
PGGNGDGDGGEAAGPQPLADVAAQPPEVVLTLASFAVTKLAYVRVTRAFREWYE
RTKGVDVRFRLTFAASGVQARAVIDGLPADIVALALPLDLKIVSAGLIRPDWRS
YPAASVVCETTVAFVVRQGNPKNIRTWEDLTRAGVEVVLANPKTAGVARWIFLAL
WGAKMKKGNAALAYVQRVFENVVVQPRDAREASDVFYKQKVGDVLLTYENEV
ILTNEVYGDKALPYLVPSYNIRIECPLALVDKVVDARGPEVREAASEFCRFLFTPAA
QHEFARLGFRVNPRTCKEVAAQQTGLPPANLWQVDKELGGWAAAQKKFFDAGAI
LDDIQSAVGKLRVEQRKAAQAAARR* (SEQ ID NO: 09)

FIG. 26

FIG. 27

Chloroplast Sulfate Transport System

